METHODS AND SYSTEMS FOR DEFINING AND DISTRIBUTING

INFORMATION ALERTS

AN APPLICATION FOR

UNITED STATES LETTERS PATENT

By

Edward Lee Bryan

Durham, North Carolina

David Tracy Bennett

Chapel Hill, North Carolina
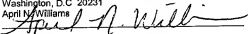
Richard Wayne Zobel, Jr.

Raleigh, North Carolina

Donald John Bell

Mebane, North Carolina

Vincent Jacques François Guilbaud

Cary, North Carolina

Description

METHODS AND SYSTEMS FOR AND DEFINING AND DISTRIBUTING

INFORMATION ALERTS

5

Related Application Information

This application is a continuation-in-part of United States patent application number 09/800,371, filed March 6, 2001, the disclosure of which is incorporated herein by reference in its entirety.

10

Technical Field

The present invention relates generally to methods and systems for creating, accessing and distributing information. More particularly, the present invention relates to a template-driven, distributed architecture for allowing individuals and groups to produce, distribute, and access information, including

15   information alerts, over a multiplicity of communication pathways to a multiplicity of end user communication devices.

Background Art

20   In the first half of the twentieth century, the primary mechanisms for information distributors to distribute information to intended recipients were printed media, such as newspapers, and radio. In the second half of the twentieth century, television became the primary medium for distributing and

accessing information. In the last decade of the twentieth century, a global computer network, commonly referred to as the Internet, became a widely used medium for distributing and accessing information. In the twenty-first century, wireless devices, such as mobile telephones and PDAs, have allowed individuals

5   to access and distribute information via the Internet without requiring a fixed network connection. During all of this time, the fixed telephone network still remains the dominant mode by which individuals communicate information with other individuals.

Due to the increased mobility of today's society, individuals desire to

10 access information from diverse sources anywhere and at any time. Such access is not possible using conventional information distribution media, such as radio and television, since programs are chosen by the broadcasters and only broadcast at times of day that are also selected by the broadcasters. In order to meet individuals' needs for ubiquitous information access, multi-modal

15 information access systems have been developed. For example, the above-referenced parent application describes an end-user definable multi-modal information access system allows individuals to define unique per-user media portals in a multi-user system. Individuals are presented with a series of templates via a web interface that allow the individuals to input sources of

20 information, keywords for searching the sources, and spoken keywords for accessing search results via a personal communications device, such as a mobile telephone. The end-user-definable, multi-modal information access system accesses the specified sources, retrieves the requested information, and delivers information to the individuals via their defined media portals. Thus, the

25 system described in the parent application solves the problem of allowing

individuals and groups of individuals to set up customized access to information anywhere at any time.

In addition to the need for ubiquitous information access, there also exists a need for ubiquitous information sharing and distribution. Information producers, such as news agencies, government agencies, companies, etc., often need to distribute information rapidly to many individuals. Conventional broadcast media, such as radio, television, or the Internet, may not be suitable for this purpose because there is no guarantee that the intended information recipients will be reached. Targeted communications mechanisms, such as the wireless and wireline telecommunications networks, like broadcast media, are also limited by the inability to guarantee that the intended recipients will receive information and the ability to acknowledge receipt of same.

One potential solution to the information distribution problem is to develop a customized system by which individuals in a particular organization are tracked, e.g., using a computerized scheduling system, wireless station tracking, and indigenous GPS, and the information is delivered to the individuals based on location information provided via the scheduling system. While such a system may be suitable for one organization, the system would require redesign for each organization in which it is implemented and there would be no mechanism for sharing information between organizations.

Accordingly, there exists a long-felt need for methods and systems for distributing and accessing information that avoid the difficulties associated with conventional communications media.

Disclosure of the Invention

The present invention includes a template-driven, distributed architecture for defining information events, defining information alerts associated with the events, and distributing the information alerts to intended recipients. The core of this architecture is referred to herein as a KNOWLEDGE SWITCH™. A KNOWLEDGE SWITCH™ includes hardware and software components configurable by templates to deliver and access information from any appropriate source and via any appropriately defined physical communications device. The KNOWLEDGE SWITCH™ includes a logic kernel that controls overall information access and distribution functions. A profiles module allows end users to define contact profiles and to associate the contact profiles with the end user's schedules. The profiles module also allows end users to define their own media portals, as described in the parent application. An input/output module sends and receives information via any type of communication device for which a device driver and suitable communication hardware have been defined. A content database stores content extracted from both public and private sources.

The components of the KNOWLEDGE SWITCH™ are end-user-configurable using a system of templates. As discussed extensively in the parent application, one type of template allows users to define their own media portals whereby information is extracted from a plurality of sources can be accessed via a variety of communications devices using user-defined spoken keywords. Another type of template that may be used to configure the KNOWLEDGE SWITCH™ includes an alert template that allows events, alert messages, and intended recipients to be defined. Still another type of template is a contact template that

allows end users to define their contact information and to associate the contact information with their schedules. Yet another type of template that may be included is a producer template that allows an information producer to produce information and make it available to end users via the KNOWLEDGE SWITCH™.

5   Additionally, the producer can act with the user template to make sure that authenticated content can be created and delivered in a fully integrated fashion. Yet another type of template allows end users to define their own media schedules so that the individuals can control the time and format in which the individuals receive content.

10   Accordingly, it is an object of the invention to provide methods and systems for distributing and accessing information that avoid the difficulties associated with conventional communications media.

    It is another object of the invention to provide a template-driven architecture that allows users to configure an information access and distribution

15   system to a particular user's needs.

    It is yet another object of the invention to provide a distributed, modular architecture for an information access and distribution in which components can be upgraded or replaced without affecting other components.

    It is yet another object of the invention to provide a system including

20   multiple KNOWLEDGE SWITCHES™ wherein the KNOWLEDGE SWITCHES™ are individually configured to respond differently to different events through system-wide defined protocols and that are also configured to communicate with other KNOWLEDGE SWITCHES™ when such an event occurs.

    It is yet another object of the invention to provide a method for

25   authenticating end users to an information access and distribution system when

such a system contacts the end user with an alert or warning which allows users to know that it is their service calling them, and also allows the system to verify that the intended user received the message.

It is yet another aspect of the invention to provide a method for producers
5 of content to include authentication information in their produced content and for end users to verify that the content being reviewed is authentic information and is from the source that is being claimed.

It is yet another object of the invention to provide a system that can individually secure multiple layers of data within a single content source. For
10 example, a piece of content used for an alert may include text, a warning message, and a photograph. Such a system would allow for the photograph to be seen only by those with "Top Secret" security clearance, the text to be seen by those with "Secret" security clearance, and the warning message to be seen by the public.

15 It is yet another object of the invention to store data in multimodal formats so that the data can be accessed and saved by users in a format that is appropriate for a given user at a given time. For example, a user may utter the words "save TV" to save content accessed via the user's mobile telephone for later viewing on his or her television set. In another example, a user may utter
20 "save PDA" to download information to his or her PDA for later access when the network is unavailable, e.g., when the user is on an airplane.

It is another object of the invention to provide an information access and distribution system that allows end users or administrators to define events that can trigger notification messages to be sent to a targeted group of intended
25 recipients. Such triggers may be activated by authorized individuals, automatic

devices that are attached to the system, or by an inference engine that is programmed to predict a certain emergency or alert.

It is yet another object of the invention to provide an information access and distribution system that provides templates for allowing end users to maintain current contact and schedule information for the purpose of defining the appropriate means of contact for receiving notification messages, or defining what content is communicated to the user when calling or otherwise contacting such a system.

Some of the objects of the invention having been stated hereinabove, other objects will become evident as the description proceeds when taken in connection with the accompanying drawings.

Brief Description of the Drawings

Preferred embodiments of the present invention will now be explained with reference to the accompanying drawings, of which:

Figure 1 is a Venn diagram of the overall architecture for a system for defining and distributing information alerts according to an embodiment of the present invention;

Figure 2 is a network diagram of an exemplary hardware architecture for a system for defining and distributing information alerts according to an embodiment of the present invention;

Figure 3 is a computer screen shot of an event template according to an embodiment of the present invention;

Figure 4 is a computer screen shot of an access information dialog box associated with the event template illustrated in Figure 3;

Figure 5 is a computer screen shot of a user information dialog box associated with the event template illustrated in Figure 3;

Figure 6 is a computer screen shot of an alert definition dialog box associated with the event template illustrated in Figure 3;

5   Figure 7 is a computer screen shot of a contact list template according to an embodiment of the present invention;

Figure 8 is a computer screen shot of a contact list template according to an embodiment of the present invention;

Figure 9 is a computer screen shot of a schedule template according to

10   an embodiment of the present invention;

Figure 10 is a computer screen shot of an individual schedule screen for associating contact profiles with the schedule according to an embodiment of the present invention;

Figure 11 is a computer screen shot of an intra-agency KNOWLEDGE

15   SWITCH™ management template according to an embodiment of the present invention;

Figure 12 is a computer screen shot of an inter-agency KNOWLEDGE SWITCH™ management template according to an embodiment of the present invention;

20   Figure 13 is a flow chart illustrating exemplary KNOWLEDGE SWITCH™ functionality associated with delivering an alert according to an embodiment of the present invention; and

Figures 14A and 14B are a network diagrams illustrating an information alert definition and distribution system according to an embodiment of the

25   present invention.

Detailed Description of the Invention

Figure 1 is a Venn diagram illustrating an exemplary overall architecture
for a system for routing and distributing information alerts according to an
5   embodiment of the present invention. In Figure 1, the system includes a
KNOWLEDGE SWITCH™ **100** that includes hardware and software components
for allowing individuals and groups to distribute and access information. In the
illustrated embodiment, KNOWLEDGE SWITCH™ **100** includes a logic kernel
102, a profiles module **104**, a plurality of input/output modules **106**, and content
10   **108** stored in one or more content databases **110**. Logic kernel **102** includes
software-configurable logic that performs core information access and
distribution functions including searching for desired content, storing the content
in database **110**, detecting or allowing the documentation of the occurrence of
events, notifying end users when an event or series of events occur, storing
15   produced content, and authenticating users desiring to access or produce
content.

Profiles module **104** stores information access profiles defined by end
users and user groups and allows the end users to access the information via
topic tuner **112**. For example, a user may utilize profiles module **104** to define
20   and store a list of stocks that the user desires to track and a keyword for
retrieving information from the system regarding these stocks. Profiles module
104 may also allow users to define contact schedules and content schedules, as
will be explained in more detail below. Profiles module **104** stores the user
profile, provides the profile information to logic kernel **102**, which obtains the
25   requested information, and allows the user to access the information via a tuner

112. The functionality for allowing end users to define profiles and extract desired information using the profiles is described in detail in the parent application and therefore will not be described further herein.

Input/output modules **106** include hardware and software that allow
5   information to be produced, accessed, and distributed in a variety of formats, including audio format, video format, text format, and graphics format. For example, input/output modules **106** may include web servers for serving HTML content via the Internet, voice over IP servers for serving audio content via the Internet, and wireless PDA servers for serving content to PDAs via a mobile
10   communications network. An exemplary hardware architecture for input/output modules **106** will be described in detail below.

According to an important aspect of the invention, KNOWLEDGE SWITCH™ **100** is configurable utilizing templates **114**. Templates **114** may be graphical templates or forms provided to end users and administrators via a web
15   interface that allow the administrators and end users to tailor KNOWLEDGE SWITCH™ **100** to meet the needs of a particular organization or individual. For example, as discussed extensively in the parent application, media portal definition templates may be provided to end users to allow the users to select information sources, keywords for searching the sources, and spoken
20   vocabulary words for accessing the search results. In Figure 1, examples of these types of templates include news template **116**, stocks template **118**, weather template **120**, interest template **122**, journals template **124**, and search template **126**. Additional types of templates that will be described in detail herein include event template **128**, contact list template **130**, daily schedule template
25   **132**, intra-agency KNOWLEDGE SWITCH™ management template **134**, and

inter-agency KNOWLEDGE SWITCH™ management template **136,** and a producer template **138.** Using a template-based architecture allows KNOWLEDGE SWITCH™ **100** to be easily configured to meet individuals' and organizations' needs.

5   KNOWLEDGE SWITCH™ **100** may include a KNOWLEDGE SWITCH CONFIGURATOR™ **140** that allows an administrator to define the types of templates that are available to end users, to define events that trigger alerts for end users, and to define the functionality of a KNOWLEDGE SWITCH™ that is modifiable by end users. KNOWLEDGE SWITCH CONFIGURATOR™ **140** may

10   be a software interface that provides template for the administrator to perform the aforementioned functions. Exemplary templates that may be associated with KNOWLEDGE SWITCH CONFIGURATOR™ **140** will be described in more detail below.

        Figure 2 is a network diagram illustrating an exemplary hardware

15   architecture of KNOWLEDGE SWITCH™ **100** and a plurality of input/output modules **106A-106F.** In the illustrated embodiment, KNOWLEDGE SWITCH™ **100** includes database platforms **200** for storing content, user profiles, and templates. Hubs **202** connect database platforms **200** to the remaining components of KNOWLEDGE SWITCH™ **100** in a redundant manner. Firewalls

20   **204** connect KNOWLEDGE SWITCH™ **100** to the Internet **206** and to private and secure networks **208.** Routing switches **210** connect KNOWLEDGE SWITCH™ **100** to input/output modules **106A-106A.** Application servers **212** include applications, such as user profile definition modules, content production modules, and notification setup modules that allow users to configure

25   KNOWLEDGE SWITCH™ **100** using templates. Hubs **214** and load balancers

216 connect application servers **212** to the remainder of KNOWLEDGE SWITCH™ **100** in a redundant and reliable manner.

Phone alert server **106A** includes hardware components for placing a large number of phone calls (up to may thousands of concurrent phone calls),

5 and, if needed, individually authenticating the receiver of a call in an emergency situation. For example, phone alert server **106A** may include hardware and software for contacting every telephone number in a geographic region and tracking whether end users are actually reached. In order to perform this function, phone alert server **106A** may include one or more computing platforms

10 **218** with interface boards that connect to public switched telephone network (PSTN) **220**. For example, computing platforms **218** may be general-purpose computers with T1 interface modules (also called Digital Line Interface Cards, or DLIC's), such as those available from companies such as DIALOGIC, Aculab, or Natural Micro Systems (NMS). The T1 interface modules are digital telephony

15 line interface cards used to connect the computer system to the end users via PSTN **220** according to a distribution list. This automatic alert functionality will be discussed in more detail below. Phone alert server **106A** preferably also includes load balancers **222** and hubs **224** for reliable, redundant connection to KNOWLEDGE SWITCH™ **100**.

20 Wireless PDA server **106B** includes hardware components for sending content to and receiving content from wireless PDA device. In the illustrated embodiment, wireless PDA server **106B** includes computing platforms **226** that include wireless PDA communications applications, such as ZeroCluck software available from Wireless Multimedia Systems Corporation. A hardware and

25 software solution such as this provides the means to contact a PDA, and without

intervention by the owner of the PDA device, upload and/or download information to/from the PDA. This functionality allows a user who is listening to a TOPIC RADIO™ MICROBROADCAST™ (described in detail in the parent application) the ability to hear a news article or journal article of interest and utter

5   the command "Save PDA" and have the article delivered automatically to their PDA without any further interaction. Wireless PDA server **106B** preferably also includes hubs **228** and load balancers **230** for reliable redundant connection to KNOWLEDGE SWITCH™ **100**.

Voice over IP and Internet server **106C** includes computing platforms **232**

10   for interfacing with PSTN **220** and Internet **206**. For example, computing platforms **232** may include voice over IP applications, such as softswitch applications and Internet applications, such as web servers. This server provides the user the ability to communicate verbally with the Knowledge Switch without needing to be connected through a PSTN telephony network.

15   Additionally this server allows the user to have a TOPIC RADIO™ web based application running on their desktop computer and utilize a voice commanded user interface to interact with this application. Voice over IP and Internet server **106C** preferably includes hubs **234** for reliable, redundant connection to KNOWLEDGE SWITCH™ **100**. Voice over IP and Internet server **106C** may

20   also include firewalls **236** for providing a secure connection to Internet/VPN **206**.

Email, fax, and SMS server **106D** includes computing platforms **238** for communicating with end users via email, fax, and short message service networks. For example, computing platforms **238** may include simple mail transport protocol (SMTP) applications for sending and receiving messages via

25   email. Computing platforms **238** may also include facsimile applications for

sending and receiving faxes. Finally, computing platforms **238** may include short message service applications, such as IS-41 or GSM-compliant applications for sending and receiving short messages via a mobile communications network. Email, fax, and SMS server **106D** may include hubs **240** for reliable, redundant

5 connection to KNOWLEDGE SWITCH™ **100** and firewalls **242** for providing a secure connection to Internet and secureVPN connections to the system **206**.

Voice systems server **106E** includes computing platforms **244** for providing a voice interface that allows end users to access search results via KNOWLEDGE SWITCH™ **100**. For example, computing platforms **244** may

10 include audio browser applications that allow end users to retrieve search results based on end user defined spoken vocabulary words, as described in the parent application. Voice system server **106E** may also include automated speech recognition (ASR), voice authentication, and text to speech (TTS) servers **246** and **248** for recognizing an individual's speech, authenticating that a voice

15 belongs to a specific individual, and converting search results from text to spoken format. Voice system server **106E** may also include hubs **250** and load balancers **252** for reliable, redundant connection to KNOWLEDGE SWITCH™ **100**.

20 <u>KNOWLEDGE SWITCH™ Customization Using Templates</u>

As indicated in Figure 1, KNOWLEDGE SWITCH™ **100** is configurable by end users using templates **116 – 138** to perform various content delivery functions. The templates include media portal templates, such as templates **116 – 126**, that allow end users to create customized media portals. These types of

25 templates were described in detail in the parent application and will not be

described in further detail herein. One type of template according to the present invention includes templates that allow users to configure KNOWLEDGE SWITCH™ 100 to deliver information to individuals in response to the occurrence of predetermined events. Such templates are generically referred to herein as

5   alert templates. The alert templates may be accessible via both end users and administrators via a web interface to configure KNOWLEDGE SWITCH™ to deliver alert messages to an individual recipient and/or to very large recipient groups in response to an event or series of events.

One type of alert template that may be used to configure KNOWLEDGE

10   SWITCH™ 100 to deliver alert messages is event template 128. Figure 3 is a computer screen shot of an alerts folder 300 including an event template 128, a contact interface 302, and an alerts interface 304 according to an embodiment of the present invention. Event template 128 allows users to configure KNOWLEDGE SWITCH™ 100 to deliver alert messages to individuals in

15   response to predetermined events. Contact interface 302 allows users to access templates for defining and editing contact profiles used by KNOWLEDGE SWITCH™ 100 to contact individuals. Alert interface 304 allows users to access event template 128 to add, edit, and delete alerts.

In Figure 3, event template 128 includes customizable fields 306, 308,

20   310 for allowing an administrator to define KNOWLEDGE SWITCH™ functionality associated with an event. For example, customizable field 306 allows the administrator to define access information for an event that allows end users to communicate an event to KNOWLEDGE SWITCH™ 100. In the illustrated example, the access information includes a spoken command, "ticket problem,"

25   and a keypad event ID "123" that allow end users communicate an event to

KNOWLEDGE SWITCH™ **100** using a mobile or landline telephone. Figure 4 illustrates an exemplary dialog box that allows the administrator to define and edit the access information that appears in customizable field **306**. In the illustrated example, dialog box **400** includes an input area **402** that allows the

5   end user to define a spoken command associated with the event being defined. This is the word that a user will speak in his or her mobile handset in order to trigger KNOWLEDGE SWITCH™ **100** to perform defined functions associated with a ticket problem event. Input area **404** allows the administrator to define default keys that the user detecting the ticket problem event inputs via a

10   telephone keypad to trigger KNOWLEDGE SWITCH™ **100** to perform ticket problem event functions. Input area **406** allows the administrator to input a description of the event to be displayed on event template **128**.

Referring again to Figure 3, customizable field **308** of event template **128** allows the administrator to define information that KNOWLEDGE SWITCH™ **100**

15   will provide to a user when the user contacts KNOWLEDGE SWITCH™ **100** using the spoken command or keypad keys associated with the ticket problem event. In the illustrated example, the user information includes a directive instructing user to enter the name, acquire a ticket number, and enter the passport ID of an airline passenger whose identification information does not

20   match the identification information on the ticket present to the gate agent.

Figure 5 illustrates an exemplary dialog box that allows the administrator to define and edit information to be included in customizable user information field **308** illustrated in Figure 3. In the illustrated example, dialog box **500** includes a first input area **502** used by the administrator to input a directive to be

25   sent to airline employees. In this example, the directive instructs the employees

to take a picture of the passenger, enter the name of the passenger, and acquire the passenger's ticket. Input area **504** contains check boxes where the administrator defines the type of input expected from the airline employees. In this example, since the picture will be stored as a computer file and the passenger's name will be in text format, the text input and attached file check boxes are marked.

Referring again to Figure 3, customizable triggered alerts information field **310** allows the administrator to configure KNOWLEDGE SWITCH™ **100** to tailor alert messages for specific recipient groups. For example, the administrator can define recipient groups, such as the FBI and gate agents, and different messages to be delivered to each group for the same event. Figure 6 illustrates an exemplary dialog box that the administrator uses to configure KNOWLEDGE SWITCH™ **100** to deliver different triggered alert messages to different groups of individuals. In the illustrated example, dialog box **600** includes a recipients input area **602** where the administrator inputs the recipients of the alert message. Message input area **604** allows the administrator to input a message to be transmitted to the recipient when an event occurs. The ability to define different messages to be sent to different recipient groups in response to the same events is an important feature of the invention.

Priority and notification input area **606** allows the administrator to input a priority level for the message. KNOWLEDGE SWITCH™ **100** uses the priority level to determine the priority with which the message is to be sent. For example, KNOWLEDGE SWITCH™ may deliver messages of higher priority before messages of lower priority when an event is detected.

Response and receipt input area **608** allows the administrator to input whether or not confirmation of receipt of the message is required and whether a response to the message is required. KNOWLEDGE SWITCH™ **100** uses the response and receipt information provided in input area **608** to determine the
5   appropriate action to take if KNOWLEDGE SWITCH™ **100** does not receive confirmation of receipt or a response to a message. For example, when confirmation of receipt is not received within a predetermined time period, KNOWLEDGE SWITCH™ **100** may resend the message and alert the administrator that confirmation and/or a response has not been received.

10   Input areas **610, 612, 614,** and **616** allow the administrator to configure KNOWLEDGE SWITCH™ **100** to deliver different message to be delivered to a different recipient group in response to detecting an event. As stated above, providing a user-friendly interface that allows an administrator to configure KNOWLEDGE SWITCH™ **100** to deliver different messages to be delivered to
15   different recipient groups is an important feature of the invention. Because event template **128** allows different messages to be defined for different groups, the amount of effort required to set up automatic inter-agency communication is greatly reduced. In the example illustrated in Figures 3-6, the administrator has configured KNOWLEDGE SWITCH™ **100** such that a ticket problem event will
20   trigger a "Be Alert" message of medium priority without need for a response that will be sent to airport customs, security, and gate agents. KNOWLEDGE SWITCH™ **100** will deliver a separate message to the FBI. The message is of higher priority, a response is required, and the specific instructions are "verify the identity of the person in our files."

Referring again to Figure 3, the administrator can edit alerts created using event template **128** using alerts interface **304**. Alerts interface **304** lists alerts that have been defined for or by a particular user. If the user has the appropriate access clearance, the user can edit alerts, define new alerts, or delete alerts

5   simply by clicking on the appropriate area of alerts interface **306**. Alerts interface **306** thus allows multiple alerts to be defined for users.

As mentioned above with regard to Figure 2, the present invention includes a contact interface **302** that provides user access to contact and scheduling templates for configuring KNOWLEDGE SWITCH™ **100** to use the

10   appropriate contact information when attempting to contact end users. Figure 7 illustrates an exemplary contact list template **130** accessible via contact interface **302** according to an embodiment of the present invention. In Figure 7, contact list template **130** includes a customizable contact profile name field **700** where the user defines a name for the contact profile. Input area **702** allows the user to

15   input a description of the contact profile. Input area **704** allows the user to define a specific contact profile as a travel profile that would be used with airline travel, and thus requests travel information each time it was entered into a user's schedule. Input area **706** allows the end user to access a schedule template for defining a schedule to be associated with the contact profile. Input area **708**

20   includes contact information, such as telephone numbers and email addresses, for the user's contact profile.

According to an important aspect of the invention, a user may define multiple contact profiles. For example, a user may define an "at work" contact profile as illustrated in Figure 7 and an "at home" profile for contacting the

25   individual at home. Figure 8 illustrates an example of an "at home" profile that a

user may define. Input areas **700 – 708** are the same as those described above with respect to Figure 7. Hence, a description thereof will not be repeated herein.

As discussed above with respect to Figure 3, the present invention may

5   also include a schedule template that allows users to associate schedule information with contact profiles. Figure 9 is a screen shot of an exemplary daily contact schedule template according to an embodiment of the present invention. The daily contact schedule template may be accessible by click on schedule input area **706** illustrated in Figures 7 and 8. In Figure 9, daily schedule template

10 **132** includes a user-editable calendar **900** that allows the user to associate days and times with contact profiles. The shaded areas in schedule **900** correspond to the shaded areas in contact interface **302**. In order to associate a time of day with a contact profile, the user simply clicks in the appropriate time cell in daily schedule **900** and selects one of the defined contact profiles. Providing an easy-

15 to-use interface that allows a user to associate contact information with the time of day increases the likelihood that an alert will reach the user because the user is more likely to keep his or her contact information current.

In addition to associating date information with contact information, calendar **900** may also allow the user to input additional relevant information

20 relating to his or her schedule. For example, referring to Figure 10, calendar **900** allows the user associate airline flight numbers **1000** with the user's contact information.

According to yet another important aspect of the invention, templates may be provided for allowing users with the appropriate security clearance to

25 configure both intra-agency and inter-agency KNOWLEDGE SWITCH™

functionality. Figure 11 illustrates an intra-agency KNOWLEDGE SWITCH™ management template according to an embodiment of the present invention. In Figure 11, intra-agency KNOWLEDGE SWITCH™ management template **134** includes a first input area **1100** for receiving user information and user

5   authentication information. A second input area **1102** allows the user to input departments within an agency for which the user desires to receive copies of alert messages. In the illustrated example, the user has selected to receive copies of alert messages for the Office of Investigations and the Air/Marine Communications Center. An agency department directory tree **1104** contains a

10   hierarchical listing of departments within an agency for the user to select and include in input area **1102**. KNOWLEDGE SWITCH™ **100** uses the information provided by the user in input area **1102** to identify users to be copied on alert messages to other users. This functionality will be described in more detail below.

15   In addition to intra-agency KNOWLEDGE SWITCH™ management, the present invention also includes a template that allows authorized users to perform inter-agency KNOWLEDGE SWITCH™ management. Figure 12 is a screen shot of an inter-agency KNOWLEDGE SWITCH™ management template according to an embodiment of the present invention. In Figure 12, inter-agency

20   KNOWLEDGE SWITCH™ management template **136** includes a recipients directory tree **1200** that lists KNOWLEDGE SWITCHES™ associated with different agencies and recipient groups within each agency. For example, the directory tree includes KNOWLEDGE SWITCHES™ for American Airlines, Customs, and Security and recipient groups within each category. The user may

25   select any of the KNOWLEDGE SWITCHES™ or recipients from recipients

directory tree **1200**, and the selection(s) will appear in input area **1202**. A central KNOWLEDGE SWITCH™ uses the data provided by the user in input area **1202** to determine recipients for various types of alert messages. Thus, template **136** provides an easy-to-use interface for allowing a single user to control alert message distribution between different agencies.

Figure 13 is a flow chart illustrating the operation of KNOWLEDGE SWITCH™ **100** based on information entered by users via templates, as described above. Referring to Figure 13, in step **ST1**, when a user attempts to access KNOWLEDGE SWITCH™, KNOWLEDGE SWITCH™ **100** authenticates the user. For example, if the user is accessing KNOWLEDGE SWITCH™ **100** via a mobile telephone KNOWLEDGE SWITCH™ **100** may require the user to speak or key in a user ID and a password. KNOWLEDGE SWITCH™ **100** may compare the user ID and password with a password for the user stored in a user database managed by KNOWLEDGE SWITCH™ **100**. Once the user has been authenticated, the user may communicate an event to KNOWLEDGE SWITCH™ **100**, for example by speaking the voice command or event ID associated with an event. Once KNOWLEDGE SWITCH™ receives the event ID, in step **ST3**, KNOWLEDGE SWITCH™ **100** sends predetermined information to the event sender. For example, in the ticket problem event discussed above, if the sender is a gate agent in an airport, KNOWLEDGE SWITCH™ **100** sends a directive to the gate agent to acquire a digital photograph, enter the name, and acquire a ticket from the passenger. In step **ST4**, KNOWLEDGE SWITCH™ **100** receives a response from the sender.

The present invention is not limited to receiving notification of events from end users. For example, in an alternate embodiment, KNOWLEDGE SWITCH™

100 may include hardware and software for automatically detecting events. For example, in the United States, when an airplane crashes, a beacon transmits a signal from the crash site. The beacon is detected by FAA receivers and communicated to FAA computers. In this example, KNOWLEDGE SWITCH **100**
5   may be coupled to FAA computers to detect crash events.

In step **ST5**, KNOWLEDGE SWITCH™ **100** determines the intended recipients of alerts triggered by the ticket problem event. This step may include searching databases **200** using the event name or event ID received from the gate agent. Potential recipients for the message may be other users within the
10   same agency or organization or users within other organizations via KNOWLEDGE SWITCHES™ associated with the other organizations. For example, a KNOWLEDGE SWITCH™ associated with an airline may send an alert to its employees who were configured to receive the alert and to a central KNOWLEDGE SWITCH™. The central KNOWLEDGE SWITCH™ may then
15   distribute the alert to recipients in other organizations.

In step **ST6**, KNOWLEDGE SWITCH™ **100** formulates the alert message to be sent to each recipient. For example, if KNOWLEDGE SWITCH™ **100** is the central KNOWLEDGE SWITCH™, KNOWLEDGE SWITCH™ **100** may send one message to users in one agency and another message to users in another
20   agency. For the ticket problem event, KNOWLEDGE SWITCH™ **100** may generate a message for FBI users that includes the photograph and passport ID of the passenger and instructions to check FBI files for the passenger. For Federal Air Marshals, KNOWLEDGE SWITCH™ **100** may generate a generic message, such as "be alert," and include the photograph of the passenger.

Once the proper messages have been formulated, in step **ST7**, KNOWLEDGE SWITCH™ **100** adds authentication information to each of the messages. In one exemplary embodiment, the authentication information may be a digital signature signed using the private encryption key of KNOWLEDGE

5 SWITCH™ **100**. End users or the KNOWLEDGE SWITCH™ that serves the end users may verify the signature by decrypting the signed messages using the public encryption key of KNOWLEDGE SWITCH™ **100**. If the decrypted signature matches the message, then the message is determined to be authentic. That is, because KNOWLEDGE SWITCH™ **100** is the only entity that

10 knows its private key, the user knows that the message came from KNOWLEDGE SWITCH™ **100**.

In step **ST8**, KNOWLEDGE SWITCH™ **100** sends the alert to each of the intended recipients using contact profiles defined by the recipients. Sending the alert to each of the intended recipients may include identifying portions of the

15 alert to be delivered to each of the recipients based on a certificate level associated with the portions of the alerts and a certificate level associated with each of the recipients. For example, an alert may include classified information and unclassified information. Only recipients with the appropriate security clearances may receive the classified information. Other recipients may receive

20 the unclassified information. KNOWLEDGE SWITCH™ **100** may include software for parsing documents based on recipient certificate levels, such as NEED TO KNOW from Info Assure Corporation.

Another aspect of delivering information to recipients may include detecting congestion in the delivery network and rerouting traffic to an alternate

25 delivery network. For example, if the network used to deliver the alert messages

is the PSTN, SS7 congestion messages transmitted between end offices may indicate that the PSTN is congested and that a recipient or group or recipients are unable to be reached because all of the trunks associated with an end office are in use. In this situation, knowledge switch **100** may reroute the alert

5   messages to be delivered over a data network, such as the Internet, or poll alternative KNOWLEDGE SWITCHES to determine if the users can be alerted via a KNOWLEDGE SWITCH in a different geographic location

The use of on-line, updateable contact profiles increases the likelihood that the alerts will reach the intended recipients using the appropriate format. In

10   one embodiment, KNOWLEDGE SWITCH™ **100** may perform a mass callout where all users in a particular geographic area are called via the telephone network using phone alert server **218** described above with respect to Figure 2.

Once the recipient receives the alert, the recipient can listen to or view the message using a defined end-user device, such as a mobile telephone, PDA,

15   computer, etc. In addition, if the end user desires to access the message in a later format, the end user can utter the words "save (MEDIUM)" where (MEDIUM) indicates the medium in which the user desires to later access the information, such as email, fax, etc. KNOWLEDGE SWITCH™ **100** may include a media format translator, such as a text-to-speech/speech-to-text converter

20   along with the appropriate delivery hardware described above with respect to Figure 2 in order to perform this function.

In step **ST9**, once the alert has been sent, KNOWLEDGE SWITCH™ **100** determines whether confirmation of receipt is required. As discussed above, event template **124** allows users to set up whether receipt confirmation is

25   required when the alert is defined. If confirmation of receipt is required,

KNOWLEDGE SWITCH™ determines whether the confirmation has received (step **ST10**). If the confirmation was not received, KNOWLEDGE SWITCH™ **100** may resend the message. If the confirmation is received, in step **ST11**, KNOWLEDGE SWITCH™ **100** records the fact that the alert was received by the end user.

In step **ST12**, KNOWLEDGE SWITCH™ **100** determines whether a response is required for the alert. Like receipt confirmations, response requirements can be set up using event template **124**, as discussed above. If a response is required, KNOWLEDGE SWITCH™ **100** determines whether the response has been received (step **ST13**). If a response has not been received, KNOWLEDGE SWITCH™ **100** may resend the alert. If a response has been received, KNOWLEDGE SWITCH™ **100** may record the fact that a response has been received (step **ST14**).

Figures 14A and 14B are network diagrams illustrating an information alert definition and distribution system according to an embodiment of the present invention. In Figures 14A and 14B, system **1400** includes a plurality of first KNOWLEDGE SWITCHES™ **100A – 100C** located at predetermined points of presence, such as airports or businesses. A plurality of second KNOWLEDGE SWITCHES™ **100D – 100F** are located at predetermined agencies, such as federal and state law enforcement agencies. Each KNOWLEDGE SWITCH™ **100A – 100F** may be similar in structure to knowledge switch **100** described above. KNOWLEDGE SWITCHES™ **100A – 100F** may be connected via computer network **1402**.

An example of system-wide KNOWLEDGE SWITCH™ operation will now be described. In Figure 14A, each KNOWLEDGE SWITCH™ defines its alerts

and associated policies using templates, as described above. In Figure 14B, when one of first KNOWLEDGE SWITCHES™ **100A – 100C** receives an alert, the receiving KNOWLEDGE SWITCH™ applies its alert policies to determine how to distribute the alert. The receiving KNOWLEDGE SWITCH™ then

5 distributes the knowledge switch to local individuals and to appropriate agency KNOWLEDGE SWITCHES™ **100D – 100F** based on the alert policy. Each agency knowledge switch applies its own alert policies and distributes the alert to appropriate individuals within the agency. As discussed above, applying an alert policy may include parsing the alert and distributing portions of the alert to

10 individuals based on individuals certificate levels. Thus, the system of KNOWLEDGE SWITCHES™ illustrated in Figure 14 delivers alerts to selected individuals even when the individuals are associated with different agencies.

Thus, as illustrated herein, KNOWLEDGE SWITCH™ **100** can be configured using templates to meet a particular organizations needs.

15 KNOWLEDGE SWITCH™ **100** includes a modular hardware architecture in which components can be replaced without affecting other components. KNOWLEDGE SWITCH™ **100** is configurable to send alert messages to users and to other KNOWLEDGE SWITCHES™. Using templates, KNOWLEDGE SWITCH™ **100** can be configured to deliver different alerts to different groups of

20 individuals in response to the same event.

It will be understood that various details of the invention may be changed without departing from the scope of the invention. Furthermore, the foregoing description is for the purpose of illustration only, and not for the purpose of limitation—the invention being defined by the claims.

25